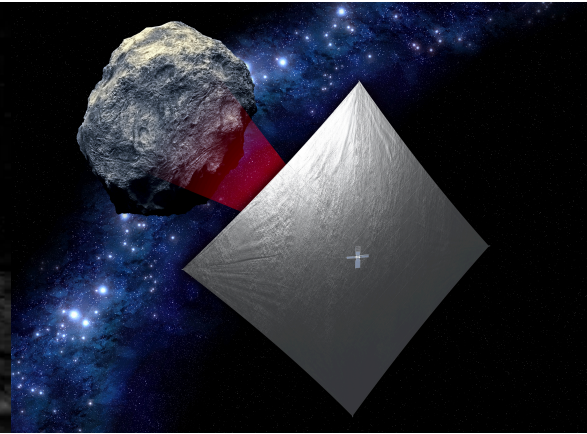
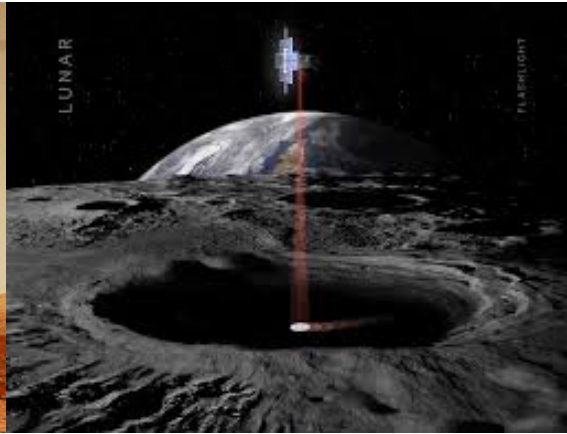




# Cubesats and Flight Software

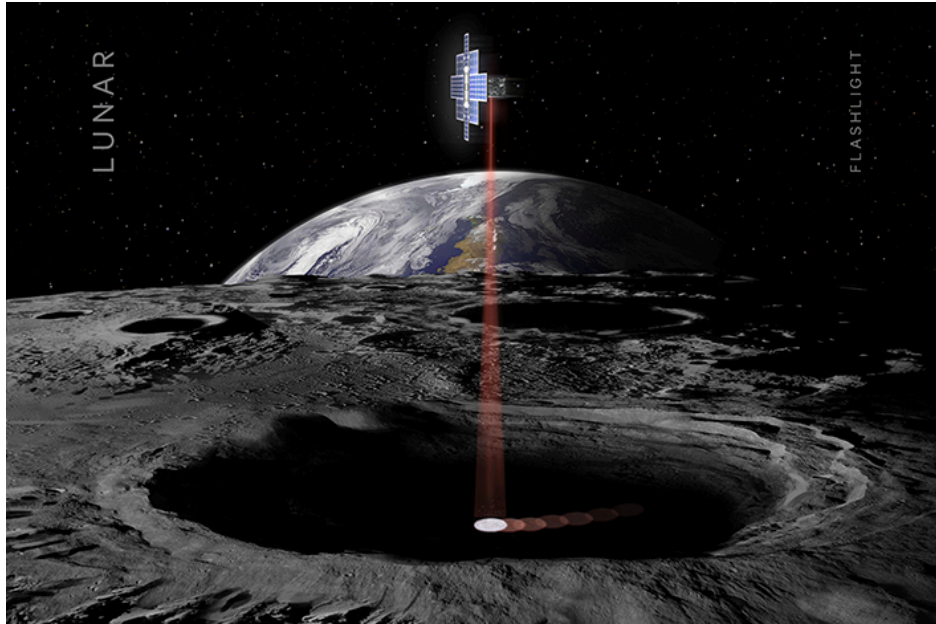


Aadil Rizvi

*Jet Propulsion Laboratory  
California Institute of Technology*

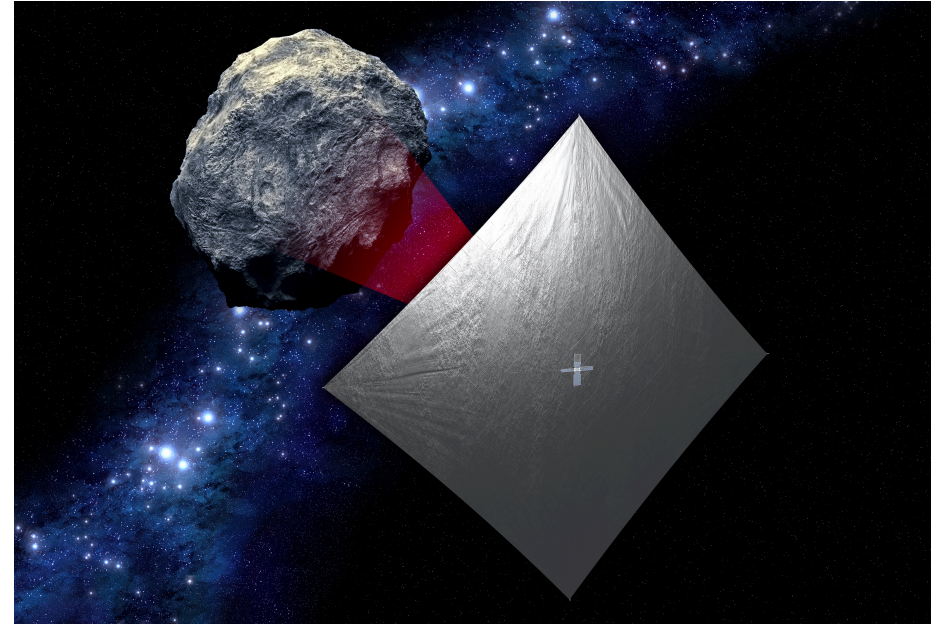
Oct. 24<sup>th</sup>, 2018

# Lunar Flashlight and Near Earth Asteroid (NEA) Scout Missions



Lunar Flashlight

- 6U cubesat mission to explore, locate and estimate size and composition of ice deposits on the Moon
- Lunar polar orbit
- Uses lasers and spectrometer to measure surface reflection and composition

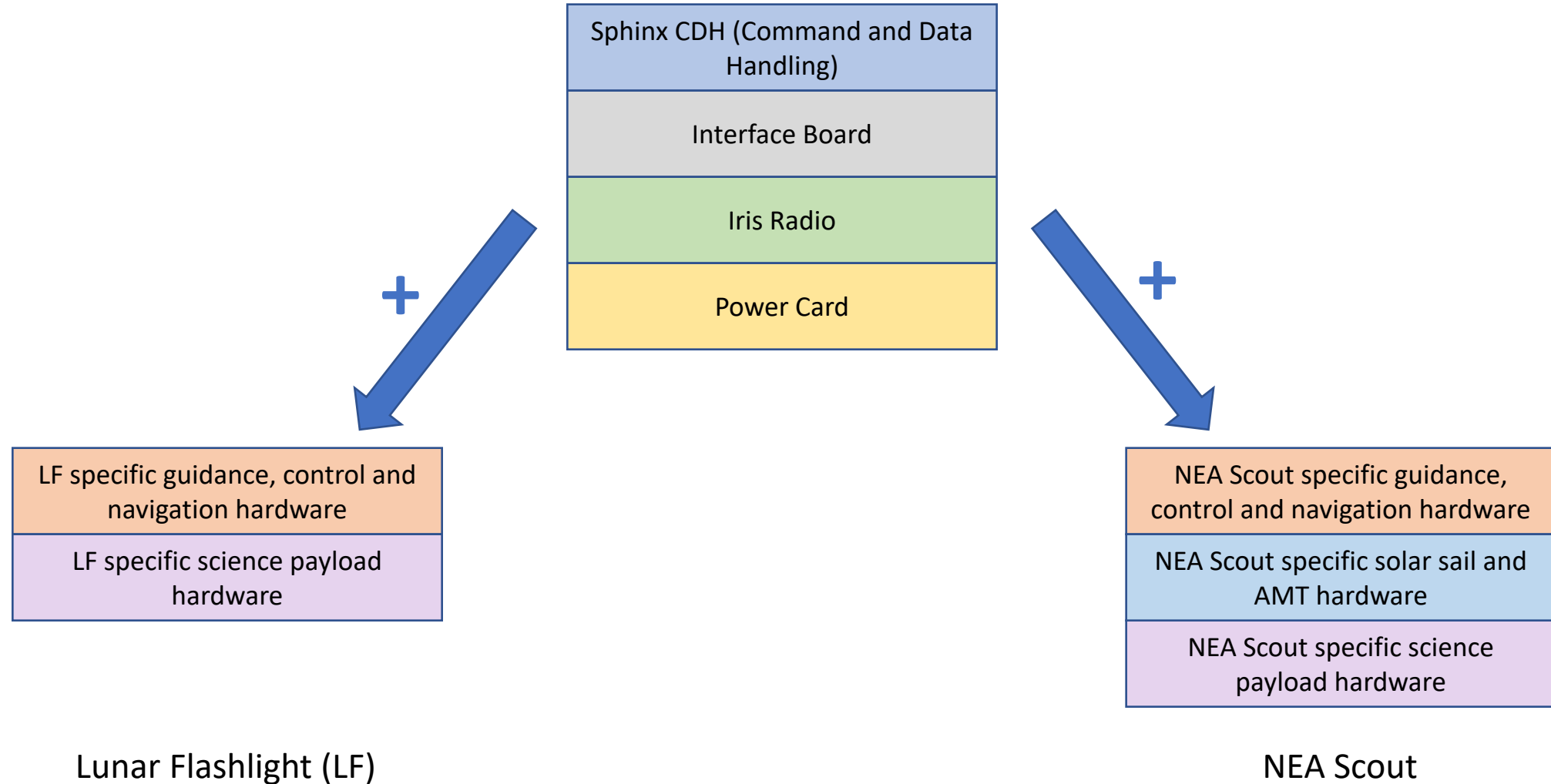


NEA Scout

- 6U cubesat mission to fly by and return data from an asteroid representative of NEAs that may one day be human destinations.
- Robotic reconnaissance mission
- Uses a science-grade multispectral camera for imaging



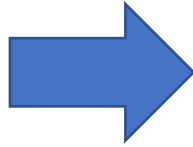
# Hardware Configurations



# Flight Software

Provides several services on-board the spacecraft including: -

- Commanding
- Telemetry
- Uplink
- Downlink
- Rate Groups
- Instrument/HW Interfaces
- Health Monitoring
- Spacecraft Time
- Fault Protection
- Memory/Data Management



<https://github.com/nasa/fprime>  
[fprime@jpl.nasa.gov](mailto:fprime@jpl.nasa.gov)



National Aeronautics and Space Administration  
**Jet Propulsion Laboratory**  
California Institute of Technology  
Pasadena, California

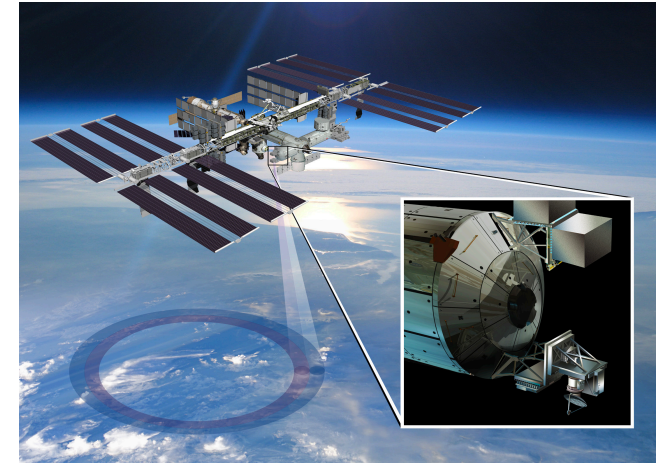
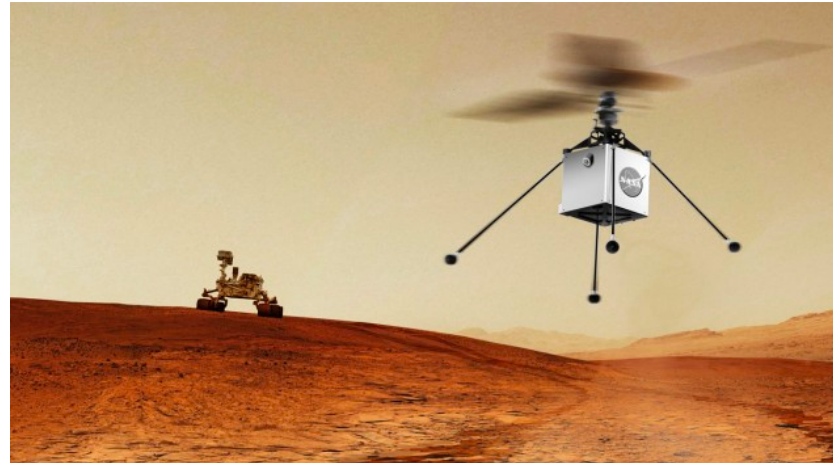
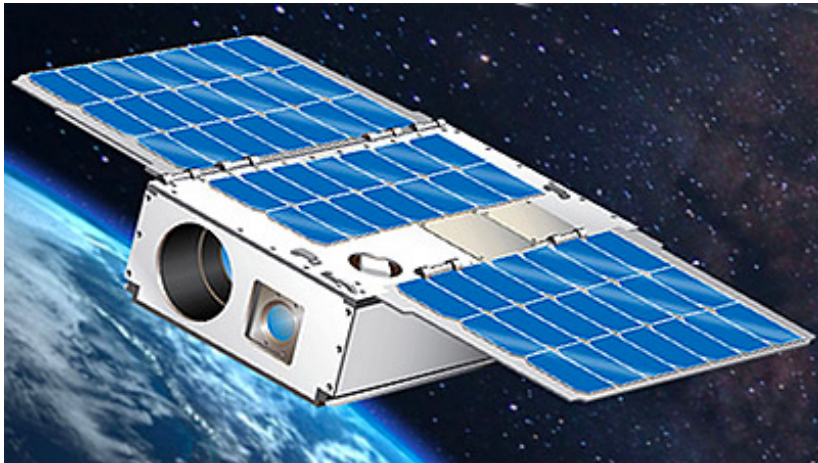
**F Prime** is tailored to small-scale system deployments including CubeSats, SmallSats, and instruments.

**F Prime** includes:

- an architecture that decomposes flight software into discrete components with well-defined interfaces
- a C++ framework that provides core capabilities such as message queues and threads
- modeling tools for specifying components and connections and automatically generating code
- a growing collection of ready-to-use components
- verification tools for testing flight software at the unit and integration levels

# Other F Prime Deployments

- ISS RapidScat
- ASTERIA
- Mars Helicopter Scout
- Europa Lander (motor controller board) - planned





Jet Propulsion Laboratory

National Aeronautics and  
Space Administration



# F'

**F Prime: a flight-proven,  
multi-platform, open source  
flight software framework**

[\*\*https://github.com/nasa/fprime\*\*](https://github.com/nasa/fprime)

[www.nasa.gov](http://www.nasa.gov)



